Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	ET Docket No. 18-21
Spectrum Horizons	)	
	)	

COMMENTS OF WI-FI ALLIANCE

Wi-Fi Alliance®[1/] submits these comments in response to the Notice of Proposed Rulemaking in the above-referenced proceeding in which the Commission plans to make spectrum above 95 GHz available for various services.[2/] Wi-Fi Alliance appreciates the Commission's efforts to keep pace with technology by considering how this spectrum can be used and by suggesting that some of it be dedicated for unlicensed operations. However, the marketplace should have the opportunity to dictate the highest and best uses of these frequencies. The Commission should therefore make limited, if any allocation of this spectrum now. Any allocations it makes should allow the necessary flexibility to permit not only Wi-Fi and other existing unlicensed technologies, but also future not-yet envisioned unlicensed uses. Any rules adopted today should not inadvertently preclude future technologies. Further, while the use of the Spectrum Horizon bands will be essential for future unlicensed applications and data

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[1/] Wi-Fi®, the Wi-Fi logo, the Wi-Fi CERTIFIED logo, Wi-Fi Protected Access® (WPA), WiGig®, the Wi-Fi Protected Setup logo, Wi-Fi Direct®, Wi-Fi Alliance®, WMM®, Miracast®, and Wi-Fi CERTIFIED Passpoint® , and Passpoint® are registered trademarks of Wi-Fi Alliance. Wi-Fi CERTIFIED™, Wi-Fi Protected Setup™, Wi-Fi Multimedia™, WPA2™, Wi-Fi CERTIFIED Miracast™, Wi-Fi ZONE™, the Wi-Fi ZONE logo, Wi-Fi Aware™, Wi-Fi CERTIFIED HaLow™, Wi-Fi HaLow™, Wi-Fi CERTIFIED WiGig™, Wi-Fi CERTIFIED Vantage™, Wi-Fi Vantage™, Wi-Fi CERTIFIED TimeSync™, Wi-Fi TimeSync™, Wi-Fi CERTIFIED Location™, Wi-Fi CERTIFIED Home Design™, Wi-Fi CERTIFIED Agile Multiband™, Wi-Fi CERTIFIED Optimized Connectivity™, and the Wi-Fi Alliance logo are trademarks of Wi-Fi Alliance.

[2/] *See Spectrum Horizons*, Notice of Proposed Rulemaking, FCC 18-17, GN Docket No. 18-21 et al. (2018) ("*NPRM*").

demands, the current demand for additional unlicensed spectrum must be met with lower-band frequencies (*e.g.*, mid-band spectrum).

Wi-Fi Alliance is a global, non-profit industry association of over 800 leading companies from dozens of countries devoted to connecting everyone and everything everywhere. With technology development, market building, and regulatory programs, Wi-Fi Alliance has enabled widespread adoption of Wi-Fi® worldwide, certifying thousands of Wi-Fi products each year. Certified, interoperable Wi-Fi systems are critical to the nation's wireless ecosystem, and are key components of the country's economic growth and catalysts for technological innovation. The mission of Wi-Fi Alliance is to provide a highly effective collaboration forum for Wi-Fi matters, grow the Wi-Fi industry, lead industry growth with new technology specifications and programs, support industry-agreed standards, and deliver greater product connectivity through interoperability, testing, and certification.

The Commission[3/] and Congress[4/] have appropriately continued to recognize that there is a desperate need for additional spectrum that can be used on an unlicensed basis for radio local

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3/ *See, e.g.*, Commissioner O'Rielly and Rosenworcel, *Driving Wi-Fi Ahead: the Upper 5 GHz Band*, FCC Blog Post (rel. Feb. 23, 2015) (noting that "Wi-Fi spectrum bands are wildly popular…[despite FCC efforts] to secure some unlicensed spectrum opportunities…more needs to be done – and soon."); *Statement of Commissioner Ajit Pai*, I*n Re Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands* FCC 15-99 (Aug. 11, 2015) ("I am a big proponent of making more spectrum available for unlicensed use"); *In Re Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band, Statement of Commissioner Mignon Clyburn*, FCC 13-22 (Feb. 20, 2013) ("unlicensed spectrum is now being heavily used to off load data traffic. The economists who have studied the area have different estimates, but there is a consensus that Wi-Fi off load saves wireless companies tens of billions of dollars in network costs each year. Demand for unlicensed services, has spiked so much that the 2.4 GHz band is now congested particularly in major cities. We have to be ambitious in finding more ways to provide…unlicensed spectrum for commercial services.")

4/ *See, e.g., Consolidated Appropriations Act 2018,* Pub. L. No. 115-141, div. P, tit. VI, § 603 (requiring the Commission to identify a minimum of 100 megahertz of spectrum below 8 GHz for unlicensed operation by 2022); § 611 (requiring the Commission to evaluate unlicensed operations in guard bands); § 617 (making the promotion of unlicensed spectrum the official policy of the United States and charging the Commission with making unlicensed spectrum a priority); and § 618 (requiring the

area networks ("RLANs") like Wi-Fi – which play a critical role in getting Americans and their devices online[5/] and otherwise serves as a key component of the telecommunications ecosystem. That is why Wi-Fi Alliance supports the Commission's plan to make additional spectrum available for unlicensed uses. However, the bands identified in this proceeding cannot be used today, nor in the immediate future, to alleviate the dramatic existing and projected shortage of capacity for unlicensed broadband connectivity.

Because of, among other reasons, the technological challenges of deploying consumer devices at such high frequencies, there has been limited attention to the operation of facilities in the bands above 95 GHz. No IEEE 802.11 Working Group has begun to develop standards for this spectrum, meaning Wi-Fi devices taking advantage of it are likely years away. Accordingly, the Commission cannot reasonably be expected to accurately predict the types of technologies that will best utilize the bands above 95 GHz, and attempting to do so may undermine applications and technologies developed in the future.

For example, several contemplated uses for these frequencies may rely on bandwidths much greater than those the Commission has proposed to make available for unlicensed devices. Advanced, short-range broadband and radiodetermination applications under consideration in Europe, for instance, would require bandwidths of tens of gigahertz in order to reach their full

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Commission to work with NTIA to draft a "National Plan for Unlicensed Spectrum" by September 23, 2020 which will lead to increased unlicensed spectrum access); and *Middle Class Tax Relief Act of 2012*, Pub. Law 112-96 §§ 6406 and 6407 (requiring unlicensed operations in the 5 GHz Band and guard bands).

5/ Cisco, *The Zettabyte Era: Trends and Analysis*, June 7, 2017 available at https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/vni-hyperconnectivity-wp.html#_Toc484556825 (noting that, by 2021, Wi-Fi will carry 53% of the world's Internet traffic).

potential.[6/] Future use of this band for high-speed communications would likely present similar needs.[7/] Thus, the Commission's proposal to make available 102.2 gigahertz of licensed and 15.2 gigahertz of unlicensed spectrum, the latter of which would be spread across multiple smaller bands, may prove insufficient to allow unlicensed operations above 95 GHz and, inadvertently, serve to handicap some technologies while advantaging others. Once a regulatory framework is established, it may be difficult to adjust it to support future technological developments. If the Commission nonetheless seeks to adopt rules allocating spectrum above 95 GHz, it should limit this action to a few frequency bands, while reserving judgement on how the remainder of the spectrum will be used in the future as technologies evolve and develop.

Given the highly limited nature of the work done to commercialize technology for bands above 95 GHz using licensed or unlicensed technologies, as well as the limited understanding of use cases and business models, the Commission may instead wish to consider a more expansive and robust experimental use regime than the type suggested in the Notice, while postponing making allocations decisions that would be difficult to modify if current assessments of how the bands will be used are inaccurate. Once standards bodies and the vendor community begin to work on spectrum above 95 GHz, and likely future applications begin to take shape, the Commission will be better positioned to adopt rules without inadvertently blocking valuable unlicensed uses.

If the Commission nevertheless proceeds to adopt rules governing the bands above 95 GHz (including with a more generous experimental regime) it may wish to consider establishing

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6/ *See*, e.g., ETSI, Technical Report 103 498 § 7.1.1.2.

7/ ITU-R Working Party 5A, Proposed Revision to Working Document Towards a Preliminary Draft New Report, ITU-R sm.[275-450ghz_sharing] (adopted Nov, 2017).

ground rules contemplated by work performed by its Technological Advisory Council ("TAC").[8/] For example, it may wish to adopt rules that incentivize receiver manufacturers to support the type of spectrum efficient engineering practices the TAC has identified. As Wi-Fi Alliance noted in its response to the TAC's proposed Spectrum Management Principles, the Commission must play an active role in efficient spectrum management, encouraging spectrum users to reasonably maintain and upgrade their systems to allow for greater sharing, rather than allowing inefficient or outdated operations by incumbents to stifle the deployment of new technologies. While it is important not to mandate the use of particular equipment or technologies, the Commission should make clear that interference protection will be based on current generation, spectrum-efficient technologies, rather than guaranteeing complete protection for whatever systems might have been deployed in the past.[9/] Similarly, the Commission might wish to consider a requirement that radios, or radio systems, introduced in the band have some lightweight Internet connectivity capability to support future software or firmware upgrades. The Commission may also wish to consider other spectrum management principles that can be implemented in currently unused spectrum.

In contrast to spectrum above 95 GHz, work is well underway to use the millimeter wave spectrum that the Commission has dedicated for unlicensed operations. WiGig, the branding used for Wi-Fi products operating in mmWave bands,[10/] will be able to offer reliable access and gigabit throughputs by using 2.16 gigahertz channels, channel bonding, and Massive MIMO

8/ *Office of Engineering and Technology Seeks Comment on Technological Advisory Council Spectrum Policy Recommendations*, Public Notice, ET Docket No. 17-340 (rel. Dec. 1, 2017).

9/ *Comments of Wi-Fi Alliance*, ET Docket No. 17-340 (filed Jan. 31, 2018).

10/ *See*, Wi-Fi Alliance, *Discover Wi-Fi Certified WiGig*, available at http://www.wi-fi.org/discover-wi-fi/wi-fi-certified-wigig.

(Multiple Input, Multiple Output with spatial multiplexing) technologies. Examples of use-cases that will take advantage of this technology include:

- Ultra short range communications.
- Ultra high definition wireless transfer applications (including wireless data syncing and docking, and transfers in smart homes).
- Mass video or data distribution to devices in classrooms, exhibition halls, or airplane or train cabins.
- Augmented reality/virtual reality headsets and other high-end wearables.
- Data center inter-rack connectivity.
- Mobile offloading and multi-band operation.
- Mobile front-hauling.
- Wireless backhauling.[11/]

But, even the deployment of 802.11 technologies in the 57-71 GHz band will not address today's needs. Instead, the relief necessary to meet current and near-term capacity requirements must come primarily from mid-band spectrum – in particular, the 5.925-7.125 GHz (the 6 GHz) band identified by the Commission in the Notice of Inquiry it released last year.[12/] The 6 GHz band is adjacent to current unlicensed U-NII bands; existing technologies designed for the 5 GHz band can be rapidly adapted and deployed in the 6 GHz band. 6 GHz propagation characteristics are similar to the 5 GHz band, making it ideal for Wi-Fi deployments. Importantly, it is the spectrum for which technology under development that will use the 802.11ax[13/] standard -- which operates with the 80 megahertz and 160 megahertz channels -- is optimized.

[11/] *See*, IEEE P802.11 Task Group ay, *Status of Project IEEE 802.11ay*, available at http://www.ieee802.org/11/Reports/tgay_update.htm. *See also*, NetworkWorld, FAQ: What is 802.11ay wireless technology?, Mar. 28, 2017, available at http://www.networkworld.com/article/3184827/wi-fi/faq-what-is-80211ay-wireless-technology.html.

[12/] *In the Matter of Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, GN Docket No. 17-183 (rel. Aug. 3, 2017).

[13/] *See*, National Instruments, *Introduction to 802.11ax High-Efficiency Wireless*, White Paper, Jul. 24, 2017, available at http://www.ni.com/white-paper/53150/en/.

Wi-Fi Alliance expects that the future will present opportunities to employ spectrum above 95 GHz for Wi-Fi and other technologies that use unlicensed spectrum. It therefore supports the Commission's efforts to identify spectrum for future use. However, the Commission should prioritize the urgent need, now and in the short-term, for access to mid-band spectrum. Spectrum above 95 GHz is not a substitute for the capacity that mid-band spectrum can provide today. Wi-Fi Alliance therefore urges the Commission to remain focused on making mid-band spectrum available, which can be used immediately to satisfied immediate requirements.

Respectfully submitted,

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